MILLIMETER/SUBMILLIMETER-WAVE SPECTROSCOPY OF THE CrP RADICAL $^4\Sigma^-$

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The millimeter/sub-mm spectrum of the CrP radical in its $X^4\Sigma^-$ ground electronic state has been recorded using direct absorption techniques in the frequency range of 340-540 GHz. This study is the first pure rotational measurement of a metal-phosphide species. CrP was synthesized in an AC discharge by the reaction of gas-phase chromium, generated from $Cr(CO)_6$, with phosphorus vapor, in argon carrier gas. Twelve rotational transitions were measured, each consisting of four fine structure components. The data were analyzed using a Hund's case b Hamiltonian; rotational, spin-spin, and spin-rotation constants were determined, improving on previous optical work. Comparison with our previous study of CrN indicates differences between metal-nitrogen and metal-phosphorus bonds.